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(54) **Razors**

(57) A safety razor comprises a blade unit (2) mounted on a handle (1) for pivotal movement in one direction from a rest position, the pivot axis (C) being arranged to underly the guard surface (10). In the rest position, the entire handle is disposed forwardly of a plane containing the trailing edge of the guard surface. The blade unit consists of a replaceable cartridge having a frame defining an opening in which the three blades (6) are mounted between a guard (10) and a lubricating strip (8) so that during a shaving stroke the guard, the first, second and third blades and the lubricating strip engage the beard in turns.

## Description

This invention relates to razors, and is particularly concerned with a safety razor of the kind comprising a handle and a blade unit mounted on the handle and capable of pivoting from a "rest" position during shaving to adjust itself to the contours of the surface being shaved. The invention also concerns a replaceable cartridge for such a razor.

In known razors the pivot axis, as seen in a direction perpendicular to a plane containing the guard surface and the edge of the blade adjacent to the guard, is located between the guard and the cap of the blade unit, i.e. generally behind the blade or blades, and the blade unit is arranged to pivot in both directions from its rest position. With such arrangements the handle tends to impede flow of water through the blade unit for rinsing away soap and shaving debris.

In accordance with the present invention there is provided a safety razor comprising a blade unit including a guard and at least one blade, and a handle mounting the blade unit for pivotal movement in one direction only from a rest position, characterized in that the pivot axis underlies the guard surface as seen in a direction normal to a plane containing the guard surface and the edge of the adjacent blade, and a rinsing space open to the underside of the blade unit and defined between the guard surface and the adjacent blade edge is substantially unobstructed by the handle to flow of rinsing water through said space when the blade unit is in the rest position.

With the pivot axis located to underly the guard surface, the force of the blades against the skin during shaving will be mainly influenced by the spring means which opposes pivotal displacement of the blade unit from the rest position and applies a restoring force to return the blade unit to the rest position when it has been deflected from that position. As a consequence if the user wishes to apply more force to the guard, for example to stretch the skin, this can be done without increasing the force of the blades on the skin. This could not be achieved by prior art razors.

A razor according to the invention allows the handle to be arranged so as not to obstruct flow of rinsing water through the blade unit and in accordance with a preferred feature, with the blade unit in the rest position, the handle is located entirely forwardly of a plane containing the edge of the blade adjacent the guard and perpendicular to said plane containing said edge and the guard surface. (For convenience the latter plane is hereinafter referred to as the "top plane" of the blade unit.) Ideally the handle is located entirely forwardly of a plane containing the nailing edge of the guard surface and perpendicular to the top plane of the blade unit.

The blade unit may be pivotally movable through an angle in the range of  $35^{\circ}$  to  $50^{\circ}$ , preferably  $40^{\circ}$  to  $45^{\circ}$ , from the rest position to a limit position, and both these end positions are conveniently defined by stops pro-

vided on the blade unit for abutment by the handle connection pieces.

In a specific embodiment of the invention, when the blade unit is in the rest position, the top plane thereof is at  $20^{\circ}$  -  $30^{\circ}$  to the longitudinal axis of the handle, i.e. the axis of that part of the handle intended to be held in the hand. Furthermore, the pivot axis is 1.0-2.0 mm, preferably 1.25-1.75 mm, from the leading blade edge and 0.50-1.00 mm below the guard surface.

In a convenient embodiment of the invention the handle is connected to the blade unit by a pair of opposed connection pieces engaging the blade unit at the respective ends thereof, the connecting pieces being urged resiliently into abutment with cam faces on the blade unit whereby to oppose displacement of the blade unit from the rest position and to apply a restoring force for returning the blade unit to the rest position after having been pivoted away therefrom, the handle having a pair of wings with tips forming the connection pieces and biased apart by the wings.

In one embodiment, the handle is intended to be used with blade units in the form of replaceable cartridges, and the wings are hinged elements acted upon by spring means incorporated in the handle structure. In another embodiment the wings are integral with the handle and are themselves resilient. In both cases the wing tips comprise pivot elements, particularly pins or stub axles, which cooperate with complementary means on the blade unit to define the pivotal connection between the handle and blade unit. Adjacent their pivot elements, the wing tips have edge surfaces which abut the cam faces. It will be appreciated that by virtue of the wing tips a simple pivot assembly with return spring is obtained. Furthermore, the blade unit can be made easily detachable by squeezing the wings together.

In accordance with a second aspect the invention provides a safety razor comprising a blade unit including a guard and at least one blade, and a handle mounting the blade unit for pivotal movement in one direction only from a rest position, characterized in that the pivot axis (C) underlies the guard surface as seen in a direction normal to a plane (P) containing the guard surface and the blade edge adjacent thereto, and a rinsing space open to the underside of the blade unit and defined between the guard surface and the adjacent blade edge is unobstructed by the handle to flow of rinsing water through said space when the blade unit is in the rest position.

More particularly the cartridge of the invention has the pivot axis in front of the three blades and below a plane that is tangent to said guard and said lubricating strip. In the specific embodiments described in detail herein the pivot axis underlies the guard surface as seen in a direction normal to a plane tangential to the guard surface and containing the edge of the first blade. The blades are mounted on respective bent supports within an opening defined by the cartridge housing so that each of the blades is oriented at an acute angle to

a plane tangential to the guard and lubricating strip, and the blades do not overlap each other.

A full understanding of the invention will be gained from the following detailed description of some specific embodiments which are given by way of non-limiting example only, reference being made to the accompanying drawings in which:

Figure 1 is a side view of a razor head portion, the blade unit thereof being shown in transverse cross section;

Figure 2 is a section taken along the line A-A in Figure 1;

Figure 3 is a partial view of the underside of the blade unit;

Figure 4 is a section taken along the line B-B of Figure 3; and

Figure 5 is an exploded perspective view of an alternative embodiment.

The safety razor illustrated in Figures 1 and 2 has a handle 1 and a blade unit or cartridge 2, the razor being of the type in which the cartridge is intended to be discarded when the blades have become dulled and to be replaced on the handle by a new cartridge with sharp blades. The blade cartridge includes a housing or frame 4 in which are received at least one blade, there being three blades 6 in the specific example shown, and a lubricating strip 8 which forms the cap of the assembly. The frame includes an integral guard member defining a guard surface 10 extending along the cartridge parallel to the leading blade edge 12. Of course, the guard surface could be defined instead by a separate member carried by the cartridge frame. At the opposite ends of the frame and adjacent the front edge thereof there are defined respective sockets 14 for reception of handle connection pieces. Each socket includes a longitudinally inwardly directed cam face 16. As best seen from Fig. 3, the cam faces are inclined to converge towards each other in the direction towards the rear of the cartridge. Immediately above each cam face is an aperture 18 directed longitudinally outwardly from the socket and having a centre which defines the pivot axis C of the cartridge when mounted on the handle.

The razor handle includes a main part, only partially shown, intended to be grasped in the hand, and a neck in the form of a yoke with opposed arms having grooves or slots in which respective wings 20 are mounted by pivots 22. The free ends or tips of the wings are biased apart by leaf springs 24 incorporated in the handle and acting on the respective wings. As shown the wings include finger grip portions 25 intermediate their ends for squeezing the wings together against the action of the springs. The wing tips engage in the respective sockets 14 of the cartridge and have stub axes 26 which engage in the apertures 18 to form the pivot between the handle and blade unit and hence define the pivot axis C. The springs 24 acting on the wings urge

the stub axes 26 into correct engagement in the apertures 18, but also press abutment edges 28 on the wing tips into contact with the cam faces 16. The sockets 14 have front and rear surfaces which serve as stops for the wing tips and thereby limit the pivotal movement of the cartridge with respect to the handle.

Due to the inclination of the cam faces 16, the wing tips bias the cartridge to a rest position, shown in Fig. 1, in which the wing tips engage the front stop surfaces of the sockets 14. When the cartridge is pivotally displaced away from this position, e.g. during shaving, the cam faces 16 cam the wing tips inwardly towards each other and a gradually increasing restoring force tending to return the cartridge to the rest position is generated.

As may be seen clearly from Fig. 1, the axis C about which the cartridge pivots with respect to the handle underlies the guard surface 10, as seen in a direction perpendicular to the top plane P of the cartridge containing the guard surface and the leading blade edge 12. The displacement between the axis C and the leading blade edge, measured in the plane P, is substantially equal to 1.5 mm and the depth of the axis C below the surface 10 is substantially equal to 0.70 mm. In the rest position, the top plane P is at an angle substantially equal to 25° relative to the longitudinal axis of the main handle part. The rear faces of the sockets 14 limit the maximum pivotal displacement of the cartridge to an angle of substantially 43°, as indicated in broken line in Fig. 1. When the cartridge is in the rest position, the rear of the cartridge is unencumbered by the handle, at least in the region of the blades, i.e. between the guard and cap. In particular, the handle is located entirely forwardly of a plane containing the trailing edge of the guard surface 10 and perpendicular to the top plane P.

To detach the cartridge, the handle wings 20 are squeezed together, e.g. between the thumb and forefinger. The stub axes 26 are retracted from the apertures 18 and the wing tip can then be withdrawn from the sockets 14. A fresh cartridge can then be mounted on the handle by the reverse procedure.

The embodiment shown in Fig. 5 is essentially the same as described above except that the wing tips with the stub axes and cam abutment edges are formed at the ends of integral wings 30 provided by a one-piece bifurcated handle. In this case the wings are resilient and their elasticity is relied upon to press the wing tips against the cam faces 16 of the cartridge.

## Claims

1. A replaceable safety razor cartridge comprising a housing (4) having a connection structure for making a removable connection to a handle and a pivoting structure (18) providing pivoting about a pivot axis (C),

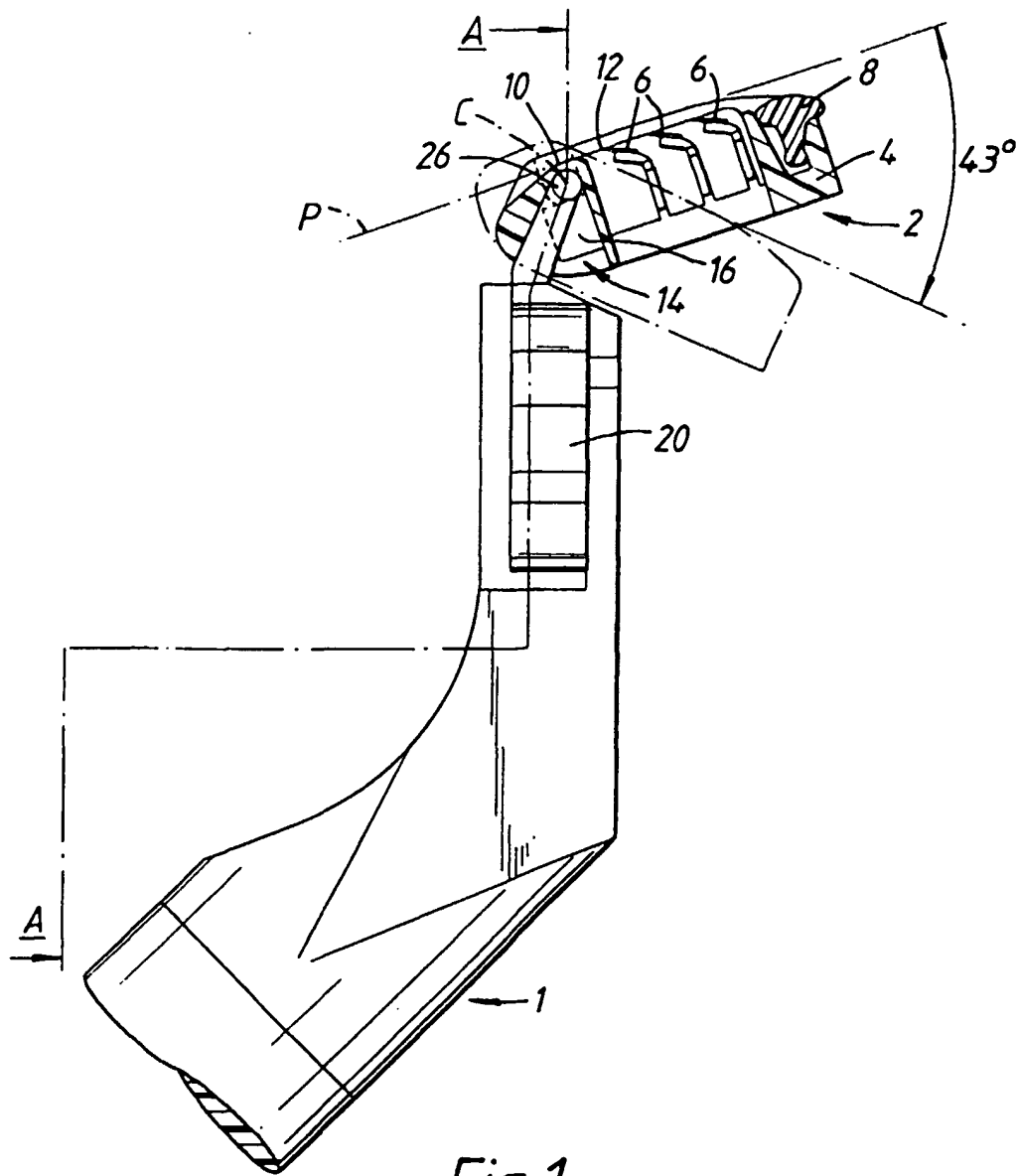
a guard (10) at the front of said housing,

- a lubricating strip (8) at the rear of said housing, and a blade, characterized in that first, second and third blades (6) are carried by said housing (4) between said guard (10) and said lubricating strip (8),  
whereby a user's beard is engaged sequentially by said guard, said first blade, said second blade, said third blade, and said lubricating strip during a shaving stroke.
2. A cartridge according to claim 1 wherein said pivot axis (C) is in front of said blades (6) and below a plane that is tangent to said guard (10) and said lubricating strip (8).
  3. A cartridge according to claim 1 or 2, wherein the pivot axis (C) underlies the guard (10) as seen in a direction normal to a plane (P) tangential to the guard (10) and containing the edge (12) of the first blade.
  4. A cartridge according to claim 1, 2 or 3, wherein said housing (4) has an opening through it underneath a plane that is tangent to said guard and said lubricating strip, and wherein said first, second, and third blades (6) are mounted in said opening.
  5. A cartridge according to any one of claims 1 to 4, wherein each of said blades (6) is disposed in a respective plane that is oriented at an acute blade angle to a plane that is tangent to said guard and said lubricating strip, and wherein said blades (6) do not overlap each other.
  6. A cartridge according to any one of claims 1 to 5, wherein each of said blades (6) is mounted on a bent support.
  7. A cartridge according to claim 6 wherein each said bent support has a support portion and a base portion, said support portion being oriented at an acute blade angle with respect to a plane that is tangent to said guard (10) and said lubricating strip (8), said base portion being generally perpendicular to said plane.
  8. A cartridge according to claim 7 wherein each of said base portions is mounted in respective opposed slots in said housing (4).
  9. A cartridge according to claim 6 wherein each of said bent supports is mounted in respective opposed slots in said housing, said opposed slots being oriented transverse to a plane that is tangent to said guard (10) and said lubricating strip (8).
  10. A cartridge according to claim 8 or 9, wherein said bent supports are movable within said opposed

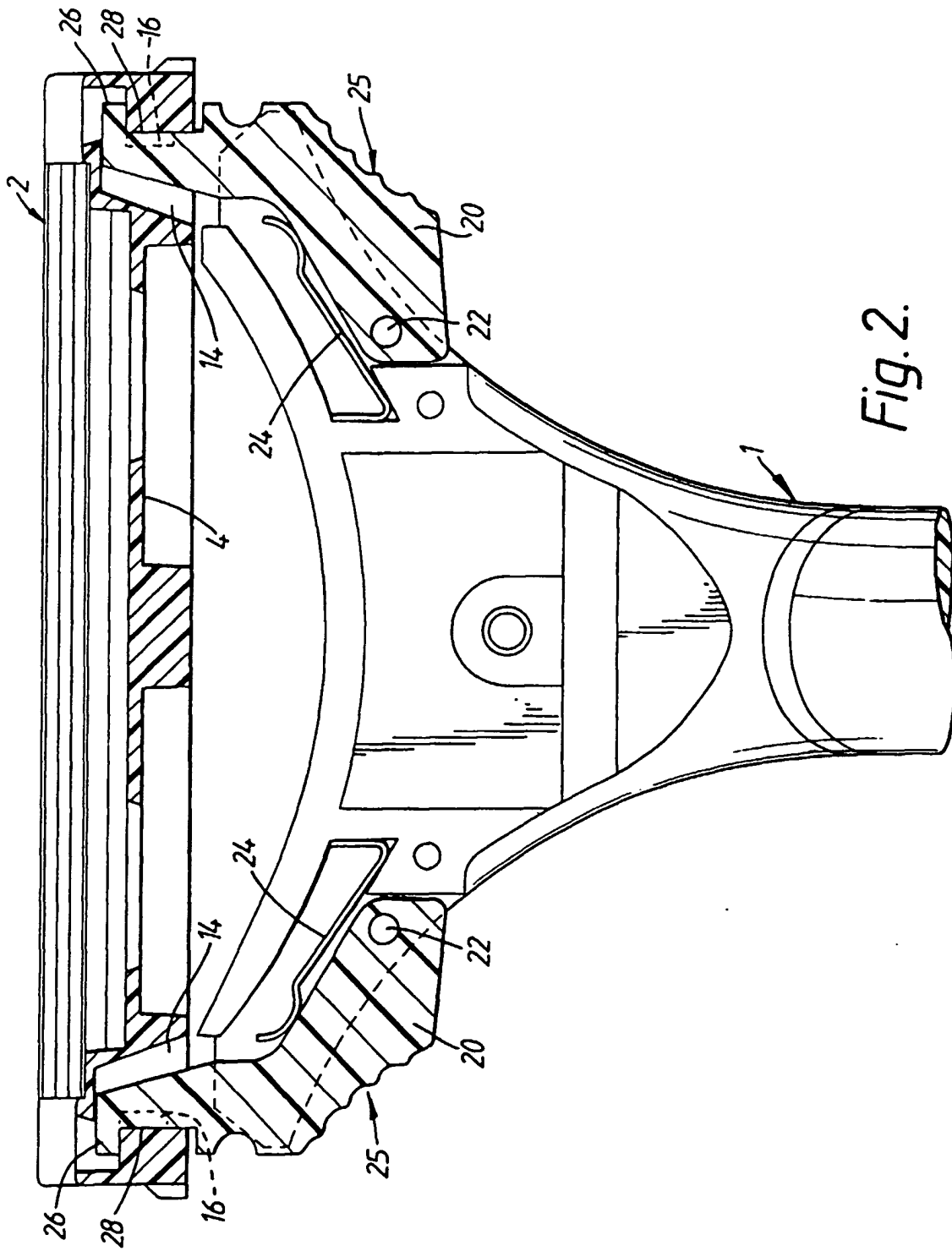
slots.

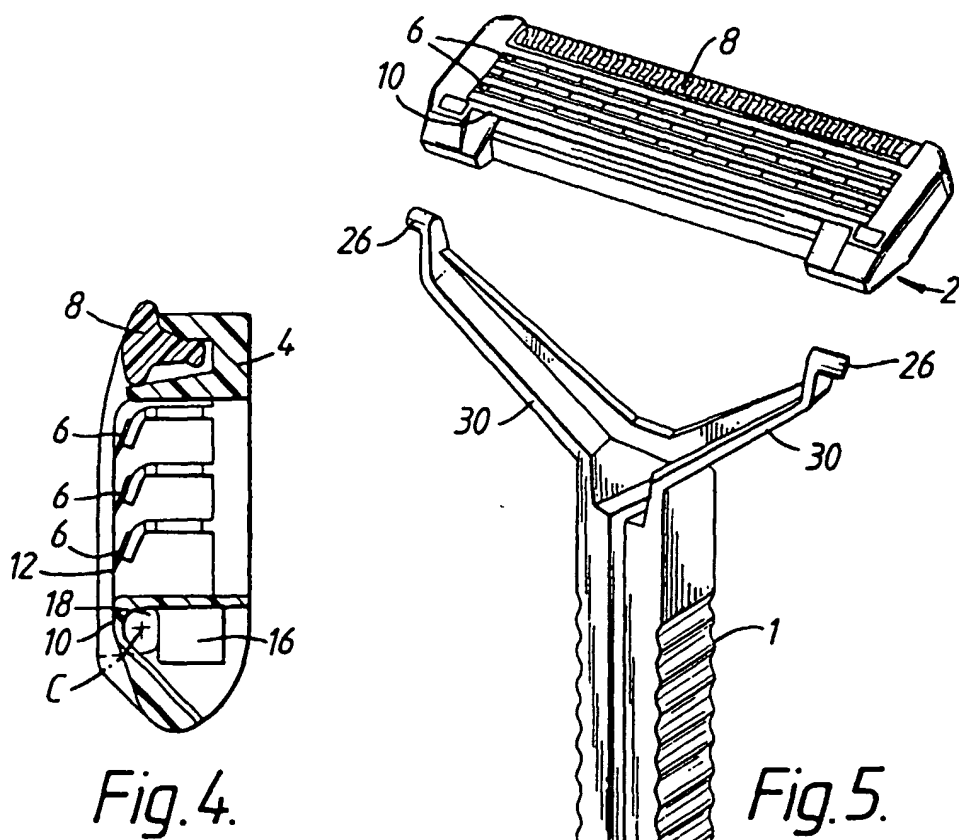
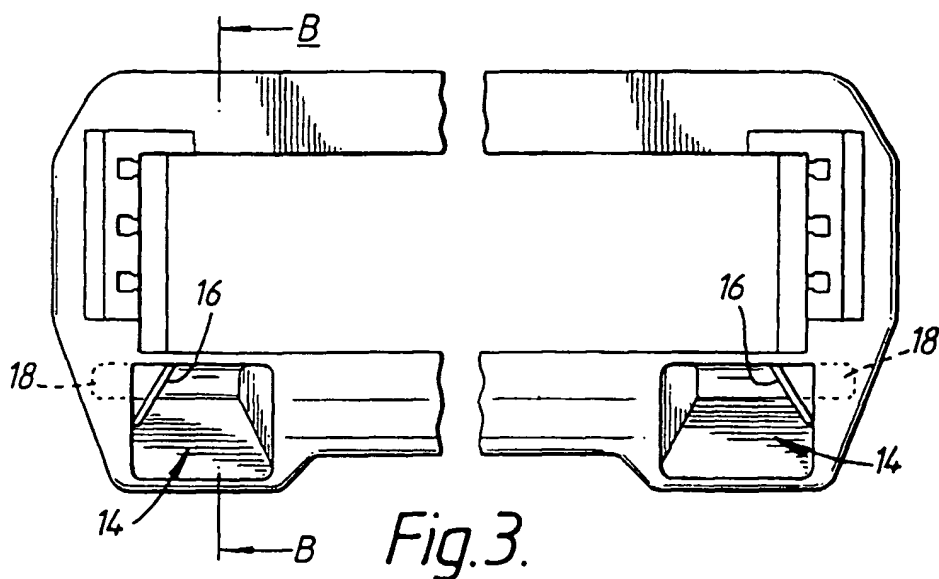
11. A cartridge according to any of claims 1 to 8 wherein said blades are mounted for movement with respect to a plane that is tangent to said guard and lubricating strip.
12. A cartridge according to any one of claims 1 to 11, wherein:  
a cam face (16) is provided for receiving forces from a handle to maintain the cartridge in a rest position, and a socket (14) extends into said bottom adjacent each end for receiving a handle connection piece.
13. A cartridge of claim 12, wherein said cam face (16) is disposed within at least one of said sockets (14).
14. A cartridge according to claim 12 or 13, wherein said sockets (14) extend below the guard (10).
15. A cartridge according to claim 12, 13 or 14, further including an aperture (18) at the inward end of said socket (14) and extending generally transversely to the socket (14).
16. A replaceable safety razor cartridge comprising:  
a housing (4) having a connecting structure for making a removable connection to a handle and a pivoting structure providing pivoting about a pivot axis,  
a guard (10) at the front of said housing,  
a lubricating strip (8) at the rear of said housing, and a blade,  
characterized in that  
first, second, and third blades (6) are carried by said housing between said guard (10) and said lubricating strip (8),  
whereby a user's beard is engaged sequentially by said guard, said first blade, said second blade, said third blade, and said lubricating strip during a shaving stroke,  
wherein said pivot axis (C) is in front of said blades (6) and below a plane that is tangent to said guard (10) and said lubricating strip (8),  
said housing (4) having an opening through it underneath a plane that is tangent to said guard (10) and said lubricating strip (8), and  
wherein said first, second, and third blades (6) are mounted in said opening.
17. A safety razor comprising a blade unit (2) including a guard and at least one blade (6), and a handle (1) mounting the blade unit for pivotal movement in one direction only from a rest position, characterized in that the pivot axis (C) underlies the guard surface

- (10) as seen in a direction normal to a plane (P) containing the guard surface (10) and the blade edge (12) adjacent thereto, and a rinsing space open to the underside of the blade unit and defined between the guard surface (10) and the adjacent blade edge (12) is substantially unobstructed by the handle to flow of rinsing water through said space when the blade unit is in the rest position.
18. A razor according to claim 17, wherein, when the blade unit is in the rest position, the handle is located entirely forwardly of a plane containing the leading blade edge (12) and perpendicular to said plane (P) containing the guard surface and adjacent blade edge.
  19. A razor according to claim 17, wherein, when the blade unit is in the rest position, the handle is located entirely forwardly of a plane containing the trailing edge of the guard surface (10) and perpendicular to said plane (P) containing the guard surface and adjacent blade edge.
  20. A razor according to claim 17, 18 or 19, wherein the blade unit (2) is pivotable through an angle in the range of  $35^{\circ}$  to  $50^{\circ}$ , preferably  $40^{\circ}$  to  $45^{\circ}$ , from the rest position.
  21. A razor according to any one of claims 17 to 20, wherein, when the blade unit is in the rest position, said plane (P) containing the guard surface of the adjacent blade edge lies at an angle of  $20^{\circ}$  to  $30^{\circ}$  to the longitudinal axis of the handle.
  22. A razor according to any one of claims 17 to 21, wherein the pivot axis (C) is from 1.0 to 2.0 mm in front of the leading blade edge (12), measured in said plane (P) containing the guard surface and blade edge.
  23. A razor according to any one of claims 17 to 22, wherein the pivot axis (C) is 0.50 to 1.00 mm below the guard surface.
  24. A safety razor according to any one of claims 17 to 23, wherein the handle is connected to the blade unit by a pair of opposed connection pieces (20) engaging the blade unit at the respective ends thereof, said connection pieces (20) being urged resiliently into abutment with cam faces (16) on the blade unit (2) whereby to oppose displacement of the blade from the rest position and to apply a restoring force for returning the blade unit to the rest position, the handle having a pair of wings (20; 30) with tips forming the connection pieces and biased apart by the wings.
  25. A razor according to claim 24, wherein the wing tips comprise pivot elements (26) engaged with complementary means (18) on the blade unit to define a fixed pivot axis (C) for the blade unit.
  26. A razor according to claim 25, wherein the pivot elements are stud axes (26) engaged in complementary apertures (18) in the blade unit.
  27. A razor according to claim 25 or 26, wherein the pivot element (26) of each tip is located adjacent to and projects beyond an edge surface (28) in contact with the blade unit cam face (16).
  28. A razor according to any one of claims 24 to 27, wherein the wing tips are received in respective sockets (14) at the ends of the blade unit, the sockets having front and rear stop faces for abutment with the tips to limit the pivotal movement of the blade unit.
  29. A razor according to any one of claims 24 to 28, wherein the wings (20) are hinged to the handle and acted upon by spring means (24) to urge the tips apart.
  30. A razor according to any one of claims 24 to 28, wherein the wings (30) are resilient and serve as spring means to urge the tips apart.
  31. A razor according to claim 30 wherein the wings (30) are integral with the handle.
  32. A razor according to any one of claims 24 to 31, wherein the blade unit (2) is detachable from the handle by squeezing the wings together to disengage the wing tips (26) from the blade unit.



*Fig. 1.*







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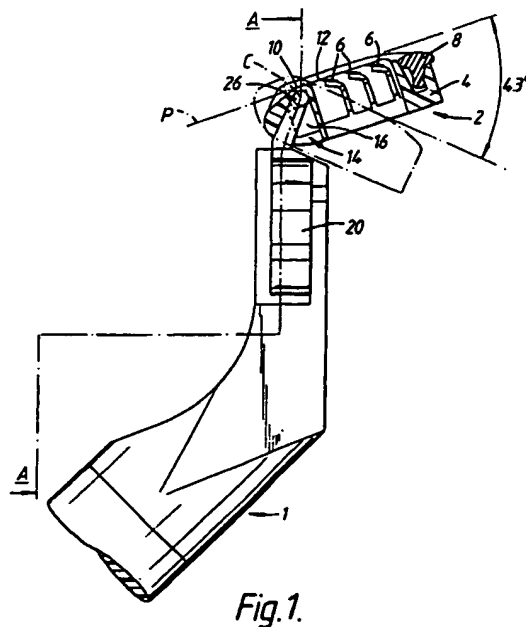
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**London, WC1V 7LE (GB)**

**(54) Razors**

(57) A safety razor comprises a blade unit (2) mounted on a handle (1) for pivotal movement in one direction from a rest position, the pivot axis (C) being arranged to underly the guard surface (10). In the rest position, the entire handle is disposed forwardly of a plane containing the trailing edge of the guard surface. The blade unit consists of a replaceable cartridge having a frame defining an opening in which the three blades (6) are mounted between a guard (10) and a lubricating strip (8) so that during a shaving stroke the guard, the first, second and third blades and the lubricating strip engage the beard in turns.





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# EUROPEAN SEARCH REPORT

Application Number  
EP 97 20 3887

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	WO 86 02309 A (GILLETTE CO) 24 April 1986 * page 3, line 15 - page 7, line 21; figures 1-3 *	1-11,16	B26B21/22
Y	US 4 200 976 A (GOODING TREVOR F) 6 May 1980 * the whole document *	1,4-11,16	
Y	US 4 715 120 A (MCGREADY ANGUS J) 29 December 1987 * the whole document *	2,3,16	
X		17	
A	DE 390 217 C (ANGST) * the whole document *	17	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B26B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 October 1998	Examiner Herygers, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			